of, downstream mechanical equipment by reducing excess wear that grit causes in a plant's mechanical equipment. This is especially important in membrane systems, as grit can both foul and damage the membranes.

Ultra Violet (UV) Disinfection System. Class A^+ effluent used for direct recharge requires that the effluent have no residual chlorine. As such, a chlorine disinfection system requires the additional step of dechlorination to achieve class A^+ effluent. For this reason, Stanley believes that the disinfection method that best serves the development is a UV system. UV systems are fast becoming an acceptable part of the treatment process due to the increasingly stringent regulations associated with the use of chlorine gas. An inline UV system is preferred because it will connect directly to the piping system, has a small footprint and requires minimum operator attention. The system is also able to treat a wide range of flow rates without a need for bypass piping.

Effluent Pump Station. Effluent from the filters can be stored below ground in a concrete storage tank. The tank would be sized based on ten minutes of peak flow on the assumption that the plant will obtain an AZPDES permit. If this is not obtained, storage requirements will increase dramatically, perhaps to as much as five days of flow. In short, without an AZPDES permit project cost and land area required would increase so much that the project would not be financially feasible.

Vertical turbine pumps would be used to pump the final effluent to its discharge location. An effluent magmeter will record discharge flow.

Digesters. Waste activated sludge (WAS) from the clarifier will be pumped to a holding tank, called a digester, that conditions and thickens the concentration of sludge prior to routing to the dewatering facility. Digesters can be either aerobic (using air to help condition the sludge) or anaerobic (no air injected into the process). These options will be reviewed during the design report phase, but in either case two digesters will be provided.

Solids Handling. The most commonly used methods of solids dewatering are belt filter presses and centrifuges. Historically, centrifuges are higher cost in both capital and O&M perspectives, but offer a "cleaner" solids handling alternative in terms of odor generation and appearance. A full analysis of solids handling alternatives should be conducted during the design report phase.

Belt filter presses function to literally squeeze the water out of the sludge, thus significantly reducing the volume of sludge to be disposed of and providing sludge in a solid form for transport. By using rollers and engineered cloth-like materials over a certain length, water is removed from the sludge (said water then being pumped back to the headworks) and a solid "cake" emerges.

Backup Power. ADEQ regulations state that sewage treatment plants must provide a backup power source to maintain operation in case of main power failure. For this report, on-site generators have been provided as the backup power source. Two generators would ultimately be provided. They offer redundancy on two levels; the generators in tandem should provide power to allow plant operation at average day flows and if one generator fails, the plant still

should be able to keep critical process units on line to avoid microbial or hydraulic upset of the plant. The second generator would be phased in during a future plant expansion.

Odor Control. Odor control is an integral part of a WWTP. Today's societal norms do not accept odors from sewage treatment plants as a part of everyday life, and the WWTP must provide appropriate means to control these odors. In addition, ADEQ regulations state that a facility without appropriate odor control requires a 1,000 foot buffer and a facility with appropriate odor control requires only a 350 foot buffer. These two basic facts combine to make odor control essential to this sewage treatment plant.

For purposes of this report, the odor control system is a multi-stage wet chemical scrubber with sodium hydroxide and sodium hypochlorite addition. This is the most common form of odor control in metropolitan areas. A full analysis of odor control alternatives should be conducted during the design report phase.

Buildings. Buildings have been provided for plant administration and laboratory space, blower housing and solids handling. It is typical to review building sizing options during design; often times, a life-cycle cost analysis favors construction of these building types in one phase because the unit cost of adding to an existing building is generally greater than construction of the building in one phase. For this report, buildout of these structures to coincide with a 8.7 mgd plant has been assumed.

Electrical, Instrumentation and Control (EIC) and Supervisory Control and Data Acquisition (SCADA). Modern sewage treatment plants depend heavily on electrical instrumentation and controls systems to achieve optimum performance. Through a combination of electric motors, variable frequency motor drives, instruments and sensors, the individual unit processes can be monitored for performance from computer terminals instead of from within the unit processes themselves. This helps to optimize the labor force while improving operator safety (by reducing the time the operator has to spend in the process basins or buildings).

The assumption has been made that this plant will have the EIC and SCADA equipment required to monitor and control the plant from a central computer terminal in the administration building. This will not eliminate operator involvement in the unit processes, but it does minimize their involvement. Alarms will also be sent to designated personnel on and off site 24 hours a day, 7 days a week to minimize response time in case of an operational problem.

Site Piping and Site Work. Sewage treatment plants require extensive pipe networks to route sewage and sludge flows through the plant. To reduce project cost and improve plant reliability, the main process train is designed to minimize or eliminate internal pump stations and maximize gravity flow. These pipe networks are a required element of the plant.

Any site of this type will require significant amounts of earthwork. Excavation of unit process locations, site grading to provide improved structural support to basins, site grading to improve aesthetic appearance, and surface toppings and features to provide dust control and improve aesthetic appearance are all required elements of construction at a sewage treatment plant. In addition, landscaping elements will improve the plant's aesthetic appeal.

Biological and Filtration Components of a Wastewater Treatment System. The biological and filtration components of a wastewater treatment system are what makes each system unique. There are advantages and disadvantages to each of the three systems that are being considered for Golden Valley South. These are described below.

Conventional Activated Sludge (CAS). The CAS system is a "tried and true" wastewater treatment system and is probably the most common form of wastewater treatment in the country. The system is composed of three primary components: (1) biological reaction tanks, (2) clarification, (3) filtration.

Biological Reaction Tanks (Aeration Basins). The aeration basins house the microorganisms (microbes) that treat the wastewater. The tanks include anoxic (minimal oxygen) and aerobic (more oxygen) zones to grow the types of microbes that break down the detrimental nutrients in the wastewater and remove Biochemical Oxygen Demand (BOD), which is a key regulatory parameter. The process also includes pumps to move the colonies of microbes and their food from the aerobic zone to the anoxic zone in kind of a "recycling of the food supply" treatment process.

Clarification. The wastewater moves from the biological reaction tanks to the clarifiers. The clarifiers act to settle out the microbes and other suspended solids that are carried over from the biological reaction tanks and either remove them from the process (into the solids handling train) or return them to the biological reaction tanks for more treatment activity. The supernatant (treated water) flows out of the clarifier over weirs located at the top of the clarifier, which assists in keeping the mixed liquor suspended solids (MLSS) in the clarifier.

Filtration. Treated water from the clarifiers moves into the filters. The filters serve as a final barrier to removing solids from the treated water. Historically, these filters have been sand or dual media (sand and coal) filters that allow water to pass through while trapping solids in the filter matrix. Effluent from the filters is typically considered Class A+ effluent once it is disinfected.

Advantages of CAS:

1. Technology is proven to be a reliable process performer.
2. Process is stable over time, or can be stabilized with relatively minor modifications if the food source changes.
3. Pool of operators with knowledge of the system is plentiful, so staffing the plant with experienced operations staff should not be a problem.
4. Operational costs are a relatively known quantity due to a wealth of historical data, and can be typically less than a membrane plant.

Disadvantages of CAS:

1. Plant takes up the most land area, so cost of land for this alternative is the highest. In the case of the Golden Valley South, this means more land area to purchase outside of section 16.
2. Construction cost for this plant is typically greater than the other alternatives due to the amount of tankage required for the process.

Extended Aeration/Biolac System. As noted, Biolac™ is a type of proprietary extended aeration system that may be considered for Golden Valley South. A brief description is provided below.

The extended aeration system with the name Biolac™ is an abbreviation for biological aeration chains. This system is an aerated lagoon reactor with clarifiers and sludge return. Air distribution to the floating, moving aeration chains provide moving waves of multiple oxic/anoxic environments. These zones provide nitrification, denitrification, and biological phosphorus removal.
Rising air from fine-bubble diffusers, suspended near the bottom of the basin, create lateral displacement of the floating aeration chains. The slow, continuous oscillation creates high-efficiency mixing using 1/3 to 1/4 the energy of fixed systems.

Advantages of the Biolac™ system

1. Lower capital costs and potentially lower operation and maintenance costs compared to conventional extended aeration systems.
2. Meets strict effluent requirements without filters.
3. Simple, low-cost construction.
4. Process stability.
5. Excellent mixing efficiency.
6. High total Nitrogen removal.

Disadvantage of the Biolac™ system:

1. Biolac™ is a patented system.

Membrane Treatment. The membrane treatment process follows the same basic flow process as the CAS process, but combines clarification and filtration in one basin. It has become the treatment process of choice in many applications because of the key advantages listed in the advantages section below. The basic elements of the process are: (1) aeration basins, (2) clarification/filtration basin.

Aeration Basin. This process is identical to the CAS process. Please refer to the CAS process for a description.

Clarification/Filtration Basin. Membrane processes combine the clarification/filtration process in one basin. The filter cartridges are installed inside the basin, and additional air is added to the basins. Solids within the basin cannot pass through the filter membranes, so they are eventually wasted or returned to the biological reaction tanks. The filter membranes are typically proprietary material that create tremendous amount of surface area for water to pass through in a small space.

Advantages of Membranes:

1. Membrane treatment plants require less land area than CAS processes. In the case of the Golden Valley South, this means less land to purchase outside of Section 16.
2. Membranes offer a true physical barrier that prevents particles of certain sizes from passing through the filters. While this advantage is maximized for water systems (i.e. dangerous microbes cannot pass into the potable water system), there is some advantage that carries over to wastewater systems.

Disadvantages of Membranes:

1. The system is the most technically complex system to operate, and it will be difficult to find well-trained operators.
2. O&M costs for the facility are typically higher because of the high energy cost of the facility.
3. The system is less flexible to system upset, particularly in new communities. For example, stormwater sediment carried through the system when contractors do not close collection system construction sites can clog membranes and force plant shutdown.

Sequencing Batch Reactors (SBRs). Sequencing batch reactors are a common method of treating wastewater in systems that do not generate significant flows (5.0 mgd or less). The system contains two components: (1) reaction chamber and (2) filtration.

Reaction Chamber. The reaction chamber in an SBR is nothing more than a holding basin for sewage flow. The basin is sized to accept raw sewage for a timed period coinciding with the minimum amount of time for the microbes to treat the sewage when the system is at maximum capacity. Therefore, as the system starts up, the sewage just stays in the tank longer, providing an opportunity to stabilize the bug colony early in the process. The amount of sewage in the tank builds to a maximum height in the tank; at this point, the treated effluent is pumped out of the tank and some sludge is wasted to the solids handling process, thus lowering the water level in the tank to a point that it can accept more raw sewage without completely destroying the microbe colony. Air is added to the process as the water level in the tank builds; at a certain level, the air is turned off, allowing the MLSS to settle to the bottom and the treated effluent to rise to the top so it can be pumped out.

Filtration. To achieve Class A+ effluent, filtration and disinfection must be added. The type of filtration can be membranes, pressure filters or sand filters. If this alternative is chosen, a study to determine the best filter for this application should be conducted during detailed design of the WWTP.

Advantages of SBRs:

1. Requires small footprint for construction of the biological treatment basin.
2. Modular design makes it easily expandable.
3. Relatively simplistic theory of operation makes it easy to understand, even for operators without much SBR experience.
4. Great range of flow capacities can be treated; i.e., has a great "turn-down" ratio.

Disadvantages of SBRs:

1. Technology becomes impractical to operate as the plant approaches 4.0 to 5.0 mgd; number of basins can make it difficult to control flow splits and you start to lose small footprint advantage due to the number of basins and flow splitter boxes required.
2. Reality of operation is that because all processes are held in one basin, operation requires good control methods for process parameters (i.e. tight range of water levels for sequencing of the process, when to start and stop air to prevent septic conditions from developing, sludge wasting rate, etc.) to make the process effective.

SBRs are typically not designed for flow projections on the order of magnitude of the Golden Valley South (8.7 mgd), so this system will, in all likelihood, be converted at some point in time. This may minimize or eliminate any life cycle cost advantage of the SBRs.

Sewage Disposal (Direct Discharge vs. Reuse).

Once sewage is treated in a WWTP, it has to be disposed of. The water can be discharged to a receiving stream, disposed of via infiltration systems, or it can be reclaimed directly for beneficial use. When determining the water balance for a development, in Arizona there is what is colloquially called “paper water”. In short, what it means is that direct discharge to a receiving stream or septic discharge cannot be used for recharge credits, even though much of the water from these discharges enters the ground and is eventually recharged into the aquifer. With this definition, most large-scale developments, particularly in established AMAs (or where local policies require extensive management of groundwater aquifers), have developed plans to reclaim the water to obtain recharge and reuse credits and improve the development’s water balance. In active management areas (AMAs), this is a required practice. This parcel is currently not in an AMA, so the water balance is not required by State Statute. However, County Planning Policies indicate that advanced groundwater basin management practices, such as recharge and reuse programs for effluent in order to reduce groundwater depletion (there is evidence to suggest that the groundwater resource is not sufficient to support the amount of development planned for the entire basin), may be required. Furthermore, as the Kingman area develops, Arizona may create an AMA

to encompass the area and this issue will have to be addressed. Also, the developer has expressed an interest in a reclaimed system as part of the allure of the property as a destination location.

While discharging to a receiving stream means that the development loses recharge credits that may be valuable to a development's water balance, there may be times when the reclaimed water system does not need the water (for example, prolonged periods of wet weather may mean a golf course does not require watering or a recharge basin area becomes saturated and does not percolate the water as quickly as usual). For this reason, Stanley believes it is prudent for the developer to apply for an Arizona Pollutant Discharge Elimination System (AZPDES) permit (see the "WWTP Approval Process" section). This will allow the WWTP the opportunity to discharge to the Sacramento Wash without fear of penalty.

Dependent on method of water reclamation (direct recharge facility or irrigation of golf courses, parks and street medians), benefits of a reclaimed water system can mean replenishment of the groundwater, reduction in potable water use, or a combination of these benefits. A reclaimed water system can extend the amount of development allowed (i.e., the number of homes built) as it reduces dependency on groundwater sources.

Ownership of the Sewage System.

There are four primary ownership alternatives for the sewage system. They are as follows:

1. The City of Kingman extends their service area to encompass the project.
2. The developer contracts with a private company or special district to own and operate the sewage system.
3. The developer forms their own company to own the system.
4. The developer can enter into separate ownership scenarios for the treatment plant and the collection system.

City of Kingman Ownership. If the developer decides to ask the City of Kingman to extend their service area, the City would assume responsibility for operation and maintenance of the sewage system. This basically means that the developer is shifting the liability and responsibility of sewage system operation to the City. Discussions with the City Engineering Department (Pete Johnson, August 19, 2004) indicate that the City's policy is to have the developer design and construct the infrastructure for City acceptance without a payback mechanism. The system is then turned over to the City for operation and maintenance. If the developer must build infrastructure that crosses the boundaries of other properties, the City does have a mechanism by which the developer can be repaid a portion of their capital cost for these common facilities.

It is noted that this alternative is unlikely to occur in the near future. This parcel is neither within nor adjacent to both the City Limits and the Kingman 2020 General Plan area. This makes annexation of the parcel difficult at best, if not impossible in the short term. Nevertheless, the potential advantages of municipal partnership may be such that the City should be approached to gage their interest (see "Incorporation of City of Kingman Downtown Plant flows into WWTP" section).

Private Company Ownership. The developer may decide to negotiate with a private sewage company to take ownership of the system. Liability for system operation is removed from the developer, but there may be more flexibility and control available to the developer based on the deal that is negotiated. Typically, the developer negotiates with a private company to keep control of infrastructure construction to some point (as an example, all of the first phase) so the developer can control the pace of development and better control costs. Infrastructure cost sharing is often a component of these deals (company would reimburse developer for capital costs the developer incurs and vice versa), so the owner may see some "time value of money" savings. Once construction of facilities is completed, ownership of the facilities can be turned over to the private company, at which point the liability for system performance also shifts to the private company. The developer would maintain liability for their constructed product. The private company would have to file a Certificate of Convenience and Necessity (CC&N) with the Arizona Corporation Commission (ACC); this is a time-consuming effort, and may impact schedule if the process is not started early in the development process.

Developer incorporates own sewage company. The developer may decide to form their own sewage utility company. This alternative involves the most paperwork and regulatory involvement (and leaves all of the liability for the system on the developer), but offers the developer the most flexibility in determining the course of action they can take. Once the company is formed, the developer can choose to negotiate system ownership or operations and maintenance deals with both the City and private companies to find the best deal. They also can maintain total control over the system if they cannot strike a favorable deal with these entities. The developer would have to file a Certificate of Convenience and Necessity (CC&N) with the Arizona Corporation Commission (ACC); this is a time-consuming effort, and may impact schedule if the process is not started early in the development process. The developer would also require personnel on staff who are properly certified as Grade 4 wastewater system operators so that an "operator of record" can be assigned.

Arizona Statutes have a provision for special public wastewater districts to be formed, which could be beneficial for the proposed project. Such a district would be a quasi-governmental agency and would require extensive legal and political effort to establish.

Developer enters into separate deals for treatment and collection systems. The developer may choose to negotiate separate contracts for collection of wastewater and treatment of wastewater. This could take any one of six permutations, based on the three potential ownership scenarios listed above. These permutations are listed below.

1. City owns collection system, private company owns treatment system
2. City owns collection system, developer owned company owns treatment system.
3. City own treatment system, private company owns collection system.
4. City owns treatment system, developer owned company owns collection system.
5. Private company owns treatment system, developer owned company owns collection system.
6. Private company owns collection system, developer owned company owns treatment system.

Use of Package Plants

The use of package plants for Golden Valley South may provide the developer with the most economic startup WWTP. Package plants are available in CAS, membrane and SBR configurations, so the plant may be able to be constructed with the treatment process of choice for the development, then be expanded into a permanent facility without having to scrap the entire package plant. With proper ancillary facilities, package plants can treat water to provide Class A+ effluent at project startup once a sufficient base load of flow has been established.

Wastewater Infrastructure System Costs

Tables 7-4 through 7-5 indicate an "order of magnitude" or "probable construction cost" cost estimate for water and wastewater infrastructure facilities. These estimates are based on the preliminary conceptual plans as shown on Figures 7-1 through 7-5. They include capital costs for completing the basic infrastructure for the system. The estimates exclude any costs for water distribution or sewer collections systems within individual sub-divisions or "villages". The estimates are intended to be used to evaluate the feasibility of the overall project. Subsequent master planning, conceptual and final design engineering services are required in order to obtain a reasonable level of precision for cost estimates for detailed planning or budgeting purposes.

Table 7-1 Golden Valley South - WWTP Expansion Table, Based on Absorption Rate

	Average Daily Flow		Average Day of Maximum Month Flow (1.2 times avg. day flow)	
	500,000 gpd startup, expand every 500,000 gallons	500,000 gpd startup, expand every 1,000,000 gallons	500,000 gpd startup, expand every 500,000 gallons	500,000 gpd startup, expand every 1,000,000 gallons
Capacity	500,000	500,000	500,000	500,000
No. of Units	2,080	2,080	1,735	1,735
Capacity	1,000,000	1,500,000	1,000,000	1,500,000
No. of Units	4,160	6,240	3,470	5,205
Capacity	1,500,000	2,500,000	1,500,000	2,500,000
No. of Units	6,240	10,400	5,205	8,675
Capacity	2,000,000	3,500,000	2,000,000	3,500,000
No. of Units	8,320	14,560	6,940	12,145
Capacity	2,500,000	4,500,000	2,500,000	4,500,000
No. of Units	10,400	18,720	8,675	15,615
Capacity	3,000,000	5,500,000	3,000,000	5,500,000
No. of Units	12,480	22,880	10,410	19,085
Capacity	3,500,000	6,500,000	3,500,000	6,500,000
No. of Units	14,560	27,040	12,145	22,555
Capacity	4,000,000	7,500,000	4,000,000	7,500,000
No. of Units	16,640	31,200	13,880	26,025
Capacity	4,500,000	8,700,000	4,500,000	8,500,000
No. of Units	18,720	36,200	15,615	29,495
Capacity	5,000,000		5,000,000	9,500,000
No. of Units	20,800		17,350	32,965
Capacity	5,500,000		5,500,000	10,430,000
No. of Units	22,880		19,085	36,200
Capacity	6,000,000		6,000,000	
No. of Units	24,960		20,820	
Capacity	6,500,000		6,500,000	
No. of Units	27,040		22,555	
Capacity	7,000,000		7,000,000	
No. of Units	29,120		24,290	
Capacity	7,500,000		7,500,000	
No. of Units	31,200		26,025	
Capacity	8,000,000		8,000,000	
No. of Units	33,280		27,760	
Capacity			8,500,000	
No. of Units			29,495	
Capacity			9,000,000	
No. of Units			31,230	
Capacity			9,600,000	
No. of Units			33,280	

Table 7-2 Golden Valley South – Sewer Demand Spreadsheet, by Section

Section	Township	Range	Land Use	Acres	Sewer Demand					
					Use Rate (1)	per/DU	DU/acre	use, gpd	pk factor	peak flow
2	20N	18W	residential	600	80	240	6	864,000	3.0	2,592,000
3	20N	18W	residential	640	80	240	6	922,000	3.0	2,766,000
4	20N	18W	residential	640	80	240	6	922,000	3.0	2,766,000
8	20N	18W	residential	620	80	240	6	893,000	3.0	2,679,000
9	20N	18W	residential	640	80	240	6	922,000	3.0	2,766,000
10	20N	18W	residential	630	80	240	6	907,000	3.0	2,721,000
11	20N	18W	residential	620	80	240	6	893,000	3.0	2,679,000
14	20N	18W	residential	480	80	240	6	691,000	3.0	2,073,000
16	20N	18W	residential	640	80	240	6	922,000	3.0	2,766,000

Total Average Day Flow = 7.900,000

Total Peak Day Flow = 23,800,000

Table 7-3 - Golden Valley South - Collection System Sizing (Manning Nomograph)

Pipe Reach	Slope, ft/ft	n	Avg Q gpd	Peak Q gpd	Diameter in
2	0.01	0.013	432,000	1,300,000	10
3	0.01	0.013	432,000	1,300,000	10
4	0.01	0.013	432,000	1,300,000	10
5	0.01	0.013	1,325,000	4,000,000	16
6	0.01	0.013	461,000	1,400,000	10
7	0.01	0.013	461,000	1,400,000	10
8	0.01	0.013	446,000	1,300,000	10
9	0.01	0.013	446,000	1,300,000	10
10	0.01	0.013	1,346,000	4,000,000	16
11	0.01	0.013	2,218,000	6,600,000	18
12	0.01	0.013	461,000	1,400,000	10
13	0.01	0.013	1,382,000	4,200,000	16
14	0.01	0.013	893,000	2,700,000	14
15	0.01	0.013	346,000	1,000,000	10
16	0.01	0.013	346,000	1,000,000	10
17	0.01	0.013	4,025,000	12,000,000	24
18	0.01	0.013	691,000	2,100,000	12
19	0.01	0.013	461,000	1,400,000	10
20	0.01	0.013	3,197,000	9,600,000	20
21	0.01	0.013	3,658,000	10,900,000	20
22	0.01	0.013	4,716,00	14,200,000	24

Table 7-4 - Golden Valley South Piping Unit Costs using Means 2005 Heavy Construction Cost Manual

Water Pipe

Pipe Type	Pipe Size	Straight Pipe Material Cost	Fittings and Services Cost	Installation Cost (40% of material cost)	Means Base Unit Cost	Kingman "City Cost" Factor	Kingman Total Unit Cost	Cost Safety Factor (25% at this stage)	Rounded Kingman Unit Cost
PVC	8"	$15.00	$3.75	$7.50	$26.25	0.916	$24.05	$30.06	$30
	12"	$28.00	$7.00	$14.00	$49.00	0.916	$44.88	$56.11	$60
	16"	$26.00	$6.50	$13.00	$45.50	0.916	$41.68	$52.10	$55
	18"	$33.00	$8.25	$16.50	$57.75	0.916	$52.90	$66.12	$70
	24"	$55.00	$13.75	$27.50	$96.25	0.916	$88.17	$110.21	$110
DIP	8"	$37.00	$5.55	$17.02	$59.57	0.916	$54.57	$68.21	$70
	12"	$54.00	$8.10	$24.84	$86.94	0.916	$79.64	$99.55	$100
	16"	$76.00	$11.40	$34.96	$122.36	0.916	$112.08	$140.10	$140
	18"	$89.00	$13.35	$40.94	$143.29	0.916	$131.25	$164.07	$165
	24"	$131.00	$19.65	$60.26	$210.91	0.916	$193.19	$241.49	$245

Sewer Pipe

Pipe Type	Pipe Size	Straight Pipe Material Cost	Manholes, Fittings and Services Cost	Installation Cost (70% of material cost)	Means Base Unit Cost	Kingman "City Cost" Factor	Kingman Total Unit Cost	Cost Safety Factor (25% at this stage)	Rounded Kingman Unit Cost
PVC	8"	$15.00	$3.75	$13.13	$31.88	0.916	$29.20	$36.50	$40
	12"	$28.00	$7.00	$24.50	$59.50	0.916	$54.50	$68.13	$70
	16"	$26.00	$6.50	$22.75	$55.25	0.916	$50.61	$63.26	$65
	18"	$33.00	$8.25	$28.88	$70.13	0.916	$64.23	$80.29	$80
	24"	$55.00	$13.75	$48.13	$116.88	0.916	$107.06	$133.82	$135
	30"	$82.00	$20.50	$71.75	$174.25	0.916	$159.61	$199.52	$200
Concrete	8"	$15.35	$3.84	$13.43	$32.62	0.916	$29.88	$37.35	$40
	12"	$22.50	$5.63	$19.69	$47.81	0.916	$43.80	$54.75	$55
	15"	$25.50	$6.38	$22.31	$54.19	0.916	$49.64	$62.04	$65
	18"	$30.50	$7.63	$26.69	$64.81	0.916	$59.37	$74.21	$75
	24"	$41.50	$10.38	$36.31	$88.19	0.916	$80.78	$100.97	$100
	30"	$76.00	$19.00	$66.50	$161.50	0.916	$147.93	$184.92	$185

Table 7-5 Golden Valley South Opinion of Probable Construction Costs

Conventional Activated Sludge WWTP - 8.0 MGD
Costs based on EPA Cost Curves adjusted to 2005 using ENR Cost Index

ITEM	ESTIMATED COST	NOTES
Influent Pumping/Metering	$550,000	Includes: earthwork, structure, electrical, ventilation, controls, appurtenances, 30' TDH
Screening	$560,000	Includes: Screens, conveyors, structure, earthwork, electrical, HVAC, controls
Grit Removal	$395,000	Includes: Equipment, structure, earthwork, electrical, controls
Activated Sludge W/ Denitrification	$9,875,000	Includes: Aeration, clarifiers, structures, earthwork, building, lab, electrical, controls
Filters	$3,950,000	Includes: Equipment, structure, earthwork, electrical, controls, HVAC
UV Disinfection	$1,770,000	Includes: Equipment, structure, earthwork, electrical, controls, HVAC
Effluent Pumping/Metering	$585,000	Includes: Equipment, structure, earthwork, electrical, controls, HVAC
Digesters	$1,875,000	Includes: Equipment, structure, earthwork, electrical, controls, HVAC
Belt Filter Press	$655,000	Includes: Equipment, structure, earthwork, electrical, controls, HVAC
Odor Control	$960,000	Includes: Equipment, structure, earthwork, electrical, controls, HVAC
Back-up Power	$795,000	Includes: Equipment, structure, earthwork, electrical, controls, HVAC
Rapid Infiltration Basins	$3,925,000	Includes: Earthwork, structures, monitoring equipment, misc. electrical
Sub-Total 1	$25,895,000	Land Costs Not Included
Site Piping & Grading 20%)	$5,180,000	
Sub-Total 2	$31,075,000	
Engineering (9%)	$2,800,000	
Construction Admin. (12%)	$3,730,000	
Permitting (2%)	$620,000	
Legal & Admin. (5%)	$1,555,000	
Contractor OH & Profit (8%)	$2,485,000	
Contractor Mobilization (6%)	$1,865,000	
Construction Cost	**$44,130,000**	**$5.52/gal**
90% of Total	**$39,720,000**	**$4.97/gal**
120% of Total	**$52,955,000**	**$6.62/gal**

Estimated construction cost of sewer line infrastructure
Approx. 100,000 LF of 10” to 24” sewer pipe, Average cost of $90/LF. **Estimated Cost of $9,000,000**